भारतीय प्रौद्योगिकी संस्थान कानपुर
Indian Institute of Technology Kanpur

Sustainable Energy Engineering

POST GRADUATE PROGRAM

Website: www.iitk.ac.in/see

SUSTAINABLE ENERGY ENGINEERING

For sustainable development and for maintaining quality of life of citizens of India as well as elsewhere in the world, energy sustainability is a vital concern. We need to understand that our energy needs are met in such a manner so that energy is conserved, managed better and produced using methods that are environmentally benign and have lower carbon footprint. The indigenous development of new, clean, alternative and renewable energy technologies necessitates strong education and R&D base in the country with focused academic programmes to develop competent human resources. The Department of Sustainable Energy Engineering (SEE) will impart high quality education and training to its students in various aspects of energy sustainability via vibrant academic programmes.

The research portfolio of the Department is envisioned into five broad verticals: *(i) Energy Generation, (ii) Energy Storage, Distribution and Usage, (iii) Alternative Fuels, and (iv) Energy, Environment,& Policy* (v) *Critical Material & Recycling,* which align well with the national and global domains in energy sustainability.

Illustration: Research verticals of the Department and the topics therein

SUSTAINABLE ENERGY ENGINEERING @ IITK

Energy Generation	Energy Storage & Distribution	Alternative Fuels	Energy, Environment & Policy	Critical Material & Recycling
				
• Solar Energy • Wind Energy • Fuel Cells • Geothermal Energy • Other new forms	• Batteries & Supercapacitors • Electrical mobility • Hydrogen storage • Solar thermal • Power distribution • Smart grid	• Hydrogen • Methanol and ethanol • Bio-energy • Waste-to-energy • Clean fuels • New Paradigms	• Energy and water • Carbon capture • Energy Policies & economics • Energy conversation • Smart buildings	• Critical minerals/materials • Urban mining • Electronic E-waste recycling • Circular economy • Materials for clean energy technology

The SEE Department will place a special emphasis on (i) solar energy conversion and storage via photovoltaics and thermal methods for energy generation, (ii) contemporary and novel battery, fuel-cell and supercapacitor materials, devices and architectures, prototypes, and system development for electric vehicles, (iii) smart grid and power distribution, (iv) hydrogen as a clean fuel with emphasis on production and storage, (v) carbon capture and (vi) urban mining . The faculty of the department has core strengths in science and engineering whose research domains are in various aspects of sustainable energy engineering. The aim of the academic programmes will be to develop engineers who will be able to connect the fundamental nuances of science and engineering of energy sustainability with energy systems development.

The department also aims to make meaningful international collaborations to benefit its students. In this direction, it already has strong linkages with Rice University in the form of Rice-IITK Collaborative Center (www.iitk.ac.in/rice-iitk/). IIT Kanpur has Joint Degree Program with various reputed International Universities details are available at: https://www.iitk.ac.in/oir/joint-degree-programs. Such initiatives are expected to provide the students opportunities for international exposure and collaborations.

POST-GRADUATE PROGRAMMES OFFERED

- **M.Tech.**
- **M.S. (by Research)**
- **Ph.D.**

The detailed admission procedure along with the eligibility criteria can be found at:

(I) www.iitk.ac.in/doaa/admission-procedure
(ii) https://iitk.ac.in/doaa/pg-manual

Lab Facilities

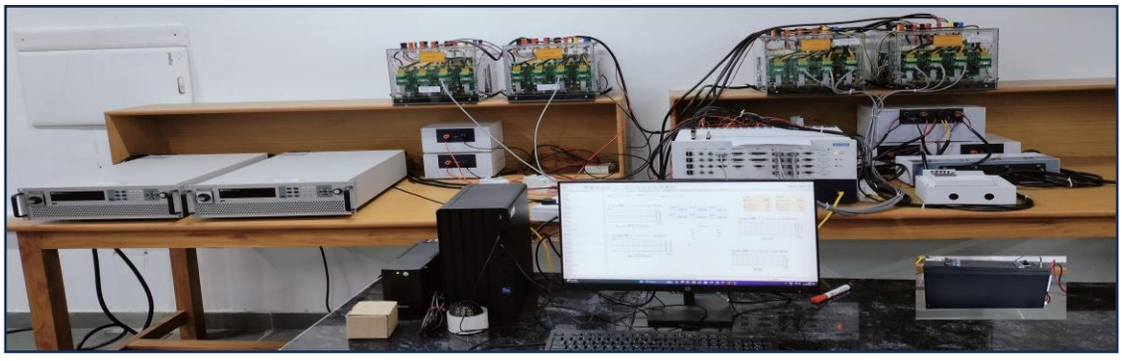
Teaching Laboratory:
Sustainable Energy Technologies lab consisting of experiments related to student training on solar photovoltaics, solar thermal, storage, hydrogen and fuel cells, smart grid, wind energy, basic electronics, temperature and flow measurements, materials synthesis and characterization

Key research laboratories:

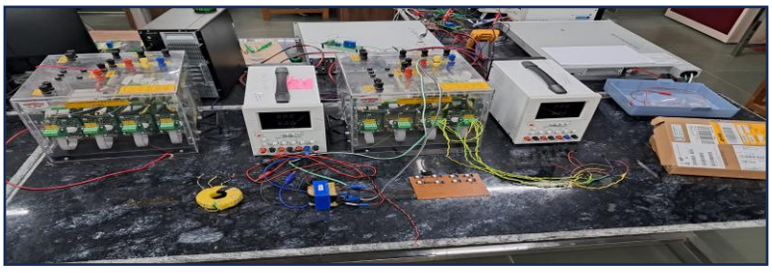
- Solar photovoltaics fabrication laboratory
- Battery materials, cell development, and characterization laboratory
- Hydrogen generation and storage laboratories
- sustaiNable pOwer innoVation tEchnoLogies (NOVEL)
- Solar thermal systems

Institute facilities:

- Advanced center for materials science
- Advanced imaging center
- Nanoscience center






FACULTY LIST

Fulltime and Joint Faculty:

Prof. Aakash C. Rai

Expertise: Energy-efficient Buildings, Impact of Climate Change on Heating and Cooling of Buildings, Indoor Air Quality, Airborne Infection Transmission, and Air Pollution.

Prof. Amarendra Edpuganti

Expertise: Power Electronics Applications in Renewable Energy, Electric Vehicles, and Fuel Cell Vehicles.

Prof. Ashish Garg

Expertise: Solar Photovoltaics, Recycling, Materials and Devices, Decarbonization.

Prof. Debopam Das (Jointly with Aerospace Engg.)

Expertise: Wind Energy, Computational Fluid Dynamics, UAVs.

Prof. Deepika Swami

Expertise: Energy Policy and Climate Change.

Prof. Lalit M. Pant

Expertise: Electrochemical Energy Conversion and Storage, Numerical Modelling, Porous Media Transport.

Prof. Laltu Chandra

Expertise: Heat Transfer and Fluid Flow, Computation and Experiment, Turbulent Flow Simulation and Modelling, Solar Thermal Sub-system Design, Nuclear Reactor Thermal Hydaraulics.

Prof. Prabodh Bajpai

Expertise: Hybrid AC-DC microgrids, Smart Grid and Renewable Integration, Solar Photovoltaics, Electricity Markets, Power System Analysis and Control.

Prof. Sayan Kar

Expertise: Carbon Capture, CO_2 Utilization, Energy Materials

Prof. Sachhida Nand Tripathi (Jointly with Civil Engg.)

Expertise: Climate Issues, Climate Modelling, Environment, and Air Pollution.

Prof. Sheo Shankar Rai

Expertise: Critical Minerals for Energy Transition, Sustainable Development of Mineral Resources and Mining Automation, Carbon Capture and Sequestration (CCS), Energy and Mining Policy

FACULTY LIST

Fulltime and Joint Faculty:

Prof. Soumyabrata Roy
Expertise: Carbon Capture and Utilization, Functional Materials, Processes & Circularity

Prof. Srinivas Karthik Yadavalli
Expertise: Halide Perovskites, Solar Cells, Multi-Junction Photoelectrodes for Green Hydrogen, Photovoltaic Recycling.

Prof. Sudarshan Narayanan
Expertise: Solid State Batteries, Thin Films for Energy Conversion, and Advanced Characterization.

Prof. Vaibhav Arghode (Jointly with Aerospace Engg.)
Expertise: Solar Thermal Energy.

Prof. Vivek Verma
Expertise: E-waste Material Recovery/Recycling, Beyond Li-ion Battery Materials Development, Bulk X-ray Characterization (EXAFS, XRF and XRD)

Adjunct Faculty:

Prof. Anubha Goel
Expertise: Vehicular Emission Analysis, Air Quality Assessment, Particle and Organic Pollutant Profiling, Health Risk Evaluation, Solid Waste Management, and Agricultural Impacts on Climate Change.

Prof. Ashutosh Sharma
Expertise: Policy Matters in Science and Technology, Battery Materials, Sensors, Nanofabrication, Functional Nano-Materials, MEMS/NEMS Systems, Soft Interfaces, Carbon Structures, and Interfacial Interactions.

Prof. Gururaj Mirle Vishwanath
Expertise: Renewable Energy Integration, Microgrids, EV-Grid Interaction, ML Applications to Power Systems

Prof. Himanshu Sharma
Expertise: Carbon Capture, Alternative Fuels.

Prof. Swathi Battula
Expertise: Electricity Markets, Modelling and Design of Electrical Energy Systems, Transactive Energy System Design, Integrated Transmission and Distribution Systems, Energy Policy and Management.

FACULTY LIST

Visiting Professor:

Prof. Arunavo Mukerjee
Expertise: The Value Chain from Upstream to the Consumer and Spanning Both Fossil Fuels and Renewable Sources.

Prof. Gurudas Nulkar
Expertise: Circular, Low Carbon Economy, Socio-Ecological Aspects of Natural Disasters, Conservation and Livelihoods.

Prof. Indu Shekhar Chaturvedi
Expertise: Renewable Energy

Prof. Navneet Chadha
Expertise: Circular Economy, Resource Efficiency, Decarbonization, Environmental Management, Enabling Policies, Impact Investments.

Prof. Sanjay Khare
Expertise: Net Zero, Decarbonisation, Circular Economy

Prof. Satyam Sahay
Expertise: Advanced Engineering and Manufacturing Technologies, Analytics and AI/ML Applications, Product Circularity, Sustainability in Metallurgical Processes.

Distinguished Visiting Professor:

Prof. Pulickel M Ajayan
Expertise: Materials Science, Nanotechnology, Chemistry, Physics.

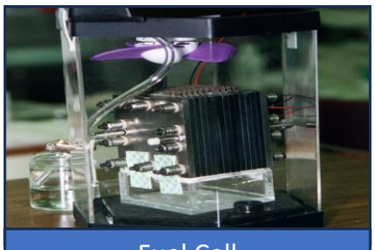
Prof. Rakesh Agarwal
Expertise: Renewable Energy Systems, Solar Photovoltaics, Biomass-to-fuels Conversion, and Energy-efficient Separation Processes for Sustainable Chemical and Energy Technologies.

BROAD RESEARCH AREAS

- Batteries and Supercapacitors
- Building Design
- Carbon Capture and Utilization
- Critical Material & Recycling
- Electric Vehicles
- Energy Economics, Policy and Regulation
- Energy Efficiency
- Fuel Cells
- Hydrogen and Alternative Fuels
- Microgrid
- NetZero and Carbon Neutrality
- Smart Grid and Renewables Integration
- Solar Photovoltaics
- Solar Thermal
- Water
- Wind Energy

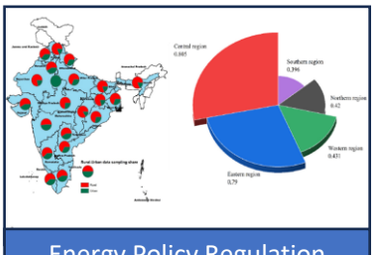

Solar Thermal


Wind Energy

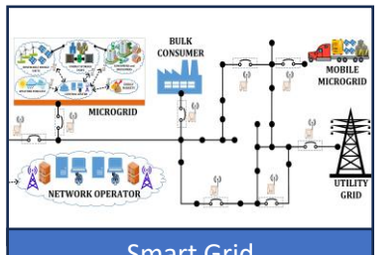

Fuel Cell

Electric Vehicles

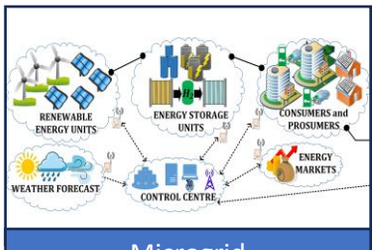

Carbon Capture & Utilization


Energy Policy Regulation


Urban Mining



Smart Grid



Microgrid


Solar Photovoltaics


Batteries & Supercapacitors


NetZero & Carbon Neutrality

CONTACT

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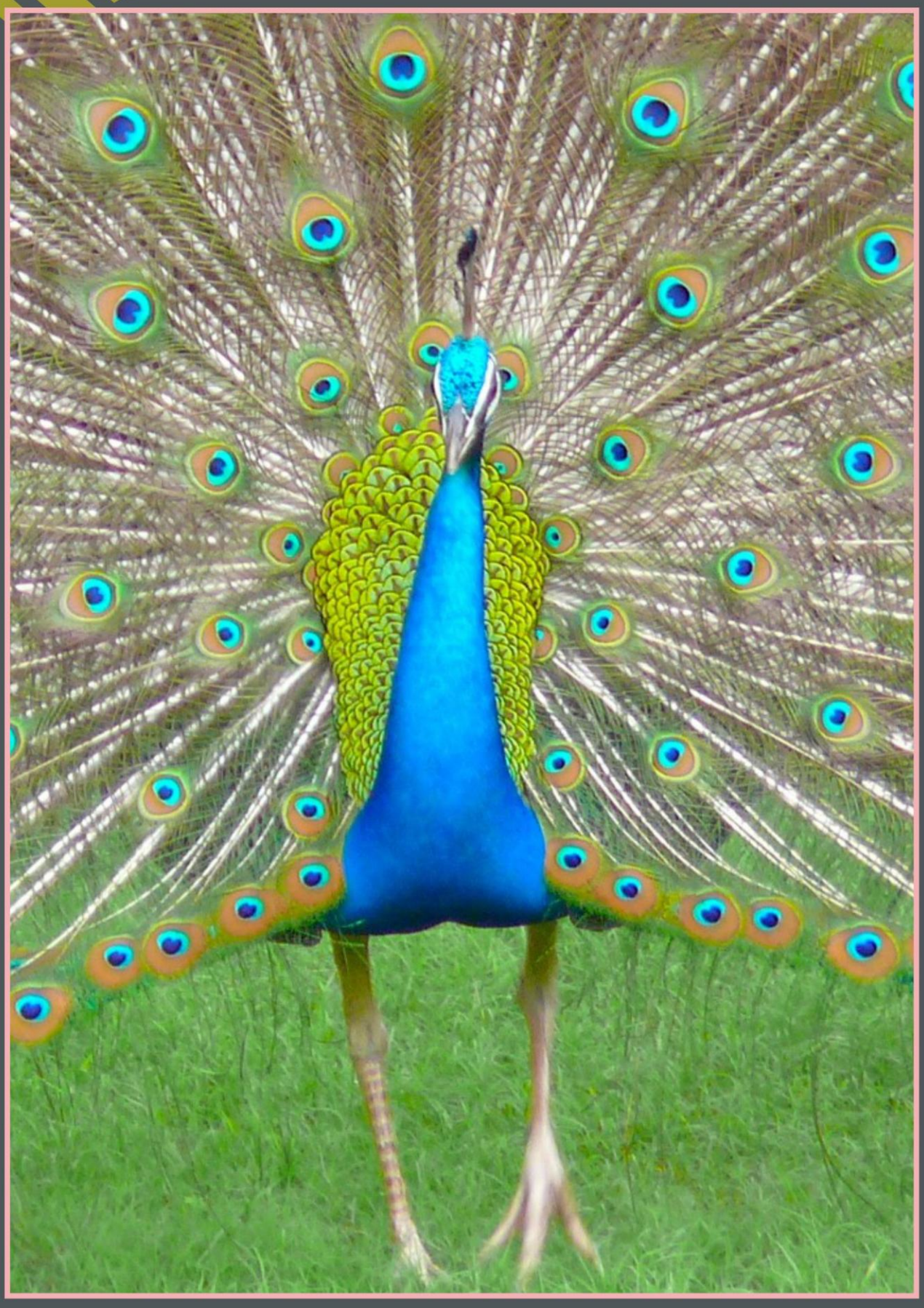
Webpage: https://www.iitk.ac.in/see/pg-programme
List of Courses: https://www.iitk.ac.in/see/List-of-courses



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